Table 3 - The Comparison Between the Steps in a Hazards Identification and Risk Analysis (HIRA) and the Steps in the Risk Analysis Screening Tool (RAST)

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Process Safety Concept	Steps in a Hazards Identification and Risk Analysis (HIRA)							Default and User-defined Options within the Risk Analysis Screening Tool (RAST)			
	HIRA Question		HIRA Step		Screening and Analysis Step in RAST			Default Industry Guidance		Options for the User-defined Entries	
Hazard	Q1	What are the hazards? *(Note 1)*	1)	Define the scope of the analysis	S1	Identify the equipment or the equipment group that will be analyzed		*n/a*	*Specific to equipment or equipment group under review (User defined)*	Yes	User enters equipment types, chemicals handled, processing conditions, and equipment layout
			2)	Identify the hazards	S2	Identify the chemical hazards	Screen for toxic, flammable, corrosive, unstable, and reactive hazards	Yes	Provides guidance on hazard severity sufficient to warrant a hazard evaluation	Yes	Option for Users to enter new chemicals, reactivity data, and mixture properties
						Identify the hazardous operating conditions	Screen for hazardous process conditions (e.g., temperatures or pressures)			Yes	Option for Users to enter facility-specific equipment design parameters and detailed processing conditions
Scenario	Q2	What can go wrong?	3)	Identify the scenarios *(Note 2)*	S3	Identify each potential hazardous scenario *(Note 3)*	Screen for scenarios with potential, undesired consequences	Yes	Provides a comparitive list of possible scenarios for analysis	Yes	Option for Users to enter facility-specific scenarios based on experience
Consequence	Q3	How bad could it be?	4)	Evaluate each scenario's loss event	S4	Evaluate each scenario's potential outcome	Screen for loss events leading to a significant incident outcome	Yes	Evaluates the loss event using standard, but simplified, release and dispersion models	Yes	Option for Users to enter detailed release and dispersion modeling results, if available (Note 4)
				Evaluate each scenario's outcome (impact)		Determine a worst-case scenario consequence	Screen for scenarios with significant impact (i.e., human harm, environmental damage or business loss)	Yes	Estimates incident outcome, impact zone, and worst-case consequence	Yes	Option for Users to enter specific consequence based on other qualitative or detailed quantitative analysis
Frequency	Q4	How often might it happen?	5)	Evaluate each scenario's frequency	S5	Determine each scenario's frequency	Determine how often a potential scenario might occur *(Note 5)*	Yes	Provides possible initiating event frequencies and enabling conditions or modifiers	Yes	Option for Users to enter specific initiating event frequencies and specific enabling conditions or modifiers
Risk	Q5	Is the risk tolerable?	6)	Evaluate each scenario's risk and the cumulative risk	S6	Estimate risk and compare to risk tolerance criteria	Screen scenarios with low unmitigated risk which may need to be addressed	Yes	Estimates individual and cumulative scenario risk and compares to a tolerable risk criteria to help identify gaps	Yes	Option for Users to enter specific risk tolerance levels (i.e., a different risk matrix)
								Users can stop here for a qualitative hazards review or they can continue with S7 to perform a LOPA, if needed.			
			7)	Evaluate each scenario's protection layers	S7	Identify additional protection layers, if needed *(Note 6)*	Consider additional engineering or administrative controls to help reduce risk	Yes	Provides capability to perform a Layer of Protection Analysis (LOPA) on selected scenarios	Yes	Option for Users to 1) Perform a LOPA on selected scenarios, and 2) Enter QRA results, if available *(Note 4)* .
Risk Management	Q6	How is risk managed?	8)	Manage the facility's risk *(Note 7)*	S8	Manage the risks throughout the facility life cycle by effectively implementing an effective process safety and risk management program *(Note 8)*		*n/a*	*Does not apply. Beyond the scope of RAST*		

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Notes:

1)	Before proceeding to Q2, *What can go wrong?,* the RAST User can screen for hazardous materials and energies. The hazardous chemicals and processing conditions establish the technical foundation - the process knowledge - which is essential for effectively understanding, evaluating, and managing the process safety risks.
2)	Scenarios may be identified by using one or more of the Process Hazards Analysis (PHA) tools, such as a What if/Checklist or a Hazards and Operability Study (HAZOP). An individual RAST scenario consists of a single Loss Event, a single Initiating Event and a single Incident Outcome
3)	Hazard scenarios are identified in RAST in Step S3; Scenarios are based on the materials, equipment, processing conditions, and equipment layout. RAST suggests possible initiating events, potential loss events, and feasible incident outcomes. RAST Users may select specific incident outcome (e.g., toxic release, fire, or explosion) when analyzing consequence or impact.
4)	If commercial, detailed release and dispersion software modeling results are available, these results can be entered into RAST. Based on RAST's risk estimates in S6, a company may decide to pursue a semi-quantitative Layer of Protection Analysis (LOPA) or a more detailed Quantitative Risk Analysis (QRA).
5)	PHA teams also assess lower consequence scenarios to help address potentially significant risks associated with these scenarios. Many of these scenarios may be adequately managed by a company's engineering practices and management systems. Some companies may require that a scenario with potentially high, unmitigated risk is to be assessed with a LOPA (see S7).
6)	Based on the default or a company-specific risk matrix, RAST uses the iterative HIRA approach to help teams identify gaps between the unmitigated risk and the tolerable risk. These gaps can be addressed by identifying Independent Protection Layers (IPLs) through a scenario-specific LOPA in S7 and then implementing and effectively managing these IPLs in S8.
7)	These management controls help ensure that the protection layers are implemented, in place, well-documented, tested, properly maintained, and sustained over the life of the facility. These barriers include engineering controls (e.g., pressure relief systems, Safety Instrumented Systems {SIS}, etc.) and administrative controls (e.g., procedures, process safety systems, etc.).
8)	These programs include policies, procedures, and practices designed to help ensure that the protection layers are in place, in use, and are effective. This includes managing asset integrity, managing process and equipment changes, responding to emergencies, and investigating incidents.